

**DISSEMINATION OF WSR-88D PRODUCTS**  
**CONCEPT PAPER**

**REVISION 1**

**MARCH 27, 2000**

## **1. INTRODUCTION**

The National Weather Service (NWS) plans to centrally collect Doppler weather surveillance radar (WSR-88D) products from all WSR-88Ds in the United States (including Puerto Rico but excluding Guam) and to make them openly available from an NWS central radar server located in Silver Spring, Maryland. Once the central radar server is operational, users of WSR-88D products will be allowed to access those products from the server. Dissemination of WSR-88D products will also be made over the NOAAPORT satellite broadcast.

Once operational, the NWS server and the other dissemination systems will replace the Next Generation Weather Radar (NEXRAD) Information Dissemination Service (NIDS) as the vehicle for providing radar products to external users.

### **1.1. Background**

The NWS has a validated requirement to centrally collect WSR-88D products to be used for the initialization of numerical models and to support forecast and warning operations. To meet this requirement, the NWS has decided to use the Advanced Weather Interactive Processing System (AWIPS) Wide Area Network (WAN) frame relay communications network to deliver radar products from the WSR-88D sites to the Network Control Facility (NCF) in Silver Spring. From the NCF, products are forwarded to the central radar server and to NOAAPORT.

A subset of radar products are disseminated to NWS field offices through the NOAAPORT satellite broadcast to meet their product requirements. All central radar server products will be forwarded to the National Centers for Environmental Prediction (NCEP) and to the National Climatic Data Center (NCDC) over separate dedicated connections. External users will be able to access WSR-88D products from either the central radar server or NOAAPORT. Appendix C depicts in a graphical format the collection and dissemination of WSR-88D products after the NIDS agreements expire.

### **1.2. Scope of the Plan**

This plan describes the actions required to centrally collect WSR-88D products via the AWIPS WAN and to implement the central radar server in order to terminate NIDS. It also contains a description of the operating concept of future dissemination systems.

## **2. EXTENSION OF THE NIDS AGREEMENTS**

The agreements between the NWS and the NIDS providers have been extended one year until September 30, 2000, with an option for additional extensions in 90-day increments. This extension is necessary to allow for a orderly transition from NIDS to the future dissemination systems. The amended NIDS agreements will expire no sooner than September 30, 2000. Extensions after that date will be made only if the replacement system is not operational.

The NWS will provide a notice of about 90 days before any extension of the NIDS agreements and before their termination.

### **2.1. Dissemination of WSR-88D Products During the NIDS Extension**

During the period of the extended agreements, the NIDS will continue to be used to disseminate real-time WSR-88D products to external users except that the NWS may disseminate WSR-88D products to the emergency management community. Until the NIDS agreements expire, any NWS connections to emergency managers will be through a secure interface and the NWS will inform the emergency management agencies that the products received may not be redistributed.

To support its operations, the NWS is distributing WSR-88D products to the field offices by NOAAPORT. In order not to compete with the providers before the NIDS agreements expire, these products are being distributed in an encrypted form. The encryption will be removed when the NIDS agreements expire.

### **2.2. Dissemination of WSR-88D Products by NIDS after the NIDS Agreements Expire**

There will be a short transition period (up to 90 days) after the NIDS agreements expire when the NIDS providers may continue to access products directly from the radar sites and disseminate them to their subscribers. However, during this period the providers will not have the exclusive arrangement they now have. The NWS will openly disseminate WSR-88D products to all users from the central radar server and over the NOAAPORT satellite broadcast upon termination of the NIDS agreements.

## **3. NWS CENTRAL RADAR SERVER IMPLEMENTATION**

The central radar server is being implemented at the collocated NCF/NWS Telecommunication Gateway (NWSTRG) in Silver Spring. All radar products received at the NCF are transferred to the central radar server. PRC has provided the interface software that operates the connection between the NCF and the central radar server. A contractor, GMSI, is implementing and configuring a commercial off-the-shelf software package on the server that will have the capability to simultaneously disseminate WSR-88D products to multiple users. GMSI will also conduct end-to-end testing of the server.

The AWIPS Program Office (APO) is responsible for the implementation of the central radar server. Chuck Piercy (W/AP01) is the focal point for the general oversight of the implementation and for PRC tasking. Nolan Miller (W/AP0) is the focal point for the GMSI tasking and procurement of the necessary hardware and software. Vico Baer (OS01) is the overall program manager.

Once operational, the central radar server will be monitored and controlled by the NWSTRG. Jim Fenix (W/OS024) is the focal point for the establishment of the 24 x 7 operational support of the server and its integration into the functions of the Office of Systems Operations (OSO). Dan Starosta (W/OS022) will be responsible for the operation of the server after implementation.

#### **4. AWIPS WAN UPGRADE**

The use of the AWIPS WAN to collect a limited set of WSR-88D products to support modernization demonstration activities began with AWIPS software release 4.1. As anticipated, this demonstration indicated that the collection of a larger set of radar products from all radar sites will require an increase in the bandwidth of the WAN. This bandwidth increase began in January 2000 and will be completed in June 2000. The OSO focal point for this activity is Michael Sikorski (W/OS015).

#### **5. TESTING THE CENTRAL RADAR SERVER**

Functional testing with Government users (i.e., Techniques Development Laboratory (TDL) and NWSTRG) began in early 2000. In the near term the testing will be expanded to the National Climatic Data Center and National Center for Environmental Prediction). Following the successful initiation of this testing, the functional testing will be expanded to include non-government users. This testing will determine if the collection system and central radar server are ready for operational use,

i.e., that the full set of NIDS products are delivered to users in a timely and reliable manner.

An operational demonstration will be conducted in the early summer of 2000. The operational demonstration of the central radar server will be planned and conducted by the OSO Systems Integration Division, Field Systems Branch. The demonstration methodology will involve the evaluation of the server's capability to collect radar products and disseminate the products within the NWS, to other Government agencies, and to external users. The target date for the certification of operational readiness is July 1, 2000. Users with test connections to the central radar server will be allowed to maintain their connections. The central radar server will become operational about 90 days after its certification of operational readiness.

All non-government users wanting to participate in the testing will be allowed to do so. They should contact Michael Carelli (W/OS014) at 301-713-1724 or email at michael.carelli@noaa.gov.

All products received from the central radar server before it becomes operational will be considered test products and are to be used for test and development purposes only. The NWS will not guarantee the availability or timeliness of products during this period. Test products and products developed from test products may not be redistributed beyond the organization receiving the products.

## **6. ACCESS TO THE CENTRAL RADAR SERVER AND FTP SERVERS**

Users will be able to access products from the central radar server using multicast open group technology. Appendix D summarizes some of the features of multicast and other access options.

### **6.1. Access to the Central Radar Server Through Multicast Open Group**

Users will be able to access WSR-88D products from the central radar server using multicast networking technology under the "open group" model. Multicast "open group" delivery does not require receiver systems to be pre-registered in the dispatcher server configuration to receive data. "Open group" users connect with the dispatcher to receive data on a file-by-file basis. Thus any receiver host that responds to server file multicast delivery announcements can receive a file at any time. The multicast "open group" model verifies delivery of files and

attempts to correct errors should they occur but makes no attempt to retransmit a file for which delivery has failed. Failed or missed product delivery can be recovered via anonymous FTP.

Users accessing products through the multicast "open group" model will need a Sun Workstation running Solaris 2.6, a Pentium workstation running RedHat Linux 6.0 or Windows 9x/NT 4.0, an HP9000 system running HP-UX 10.20 or an IBM system running AIX 4.3. They will also need licensed Starburst receiver software, utilities and configuration files, which the NWS will provide.

Users will also need a dedicated line to the central radar server. That line will need a 1.5 Mbps bandwidth to reliably receive products. Users with existing lines into NWSRG will be able to use those lines as long as those line have 1.5 Mbps bandwidth available. It will be each user's responsibility to procure, operate and maintain this line. The cost of the line is also the user's responsibility.

## **6.2. Access to the NWSRG FTP Servers Through Anonymous File Transfer Protocol (FTP)**

The central radar server products will be multicast to NWSRG FTP servers. Users will be able to access WSR-88D products from the NWSRG servers using anonymous FTP. FTP users are not registered and delivery of the product files is not verified.

Anonymous FTP users should be able to use any hardware that supports FTP service.

Anonymous FTP users will be able to access the NWSRG FTP servers through a dedicated line or Internet connectivity. Users with dedicated line access will be responsible for procuring, operating and maintaining the line. The cost of the line is also the user's responsibility.

## **6.3. Access to the Central Radar Server Through Multicast Closed Group**

Government users also have the option to access WSR-88D products from the central radar server using multicast technology under the "closed group" model. These users must be pre-registered in the dispatcher server configuration. The protocol not only verifies delivery of files and attempts to correct errors should they occur but also attempts to retransmit a file to a registered receiver host for which deliver has failed. Multicast "closed group" model has the same hardware and software requirements as

the multicast "open group" model.

Users will also need a dedicated line to the central radar server. That line will need a 1.5 Mbps bandwidth to reliably receive products. Users with existing lines into NWSTG will be able to use those lines as long as those line have 1.5 Mbps bandwidth available. It will be each user's responsibility to procure, operate and maintain this line. The cost of the line is also the user's responsibility.

Initially, multicast "closed group" access will be available only to Government users with 24 x 7 staffed operations. In the future, this type of access will be evaluated to determine the feasibility of making it available to all external users.

#### **6.4. Access Agreements and Fees**

Non-NOAA users accessing the central radar server or NWSTG FTP servers through dedicated lines will be required to sign an agreement with the NWS before accessing products.

Non-Government users without prior quid pro quo agreements with the NWS that access the central radar server or NWSTG servers through dedicated lines will be charged a fee to reimburse the NWS for its incremental cost of disseminating the products (i.e., the operation and management of the server external user access ports and any software licenses). Fees will not be assessed to any user accessing the servers during the test period before the servers are declared operational.

Users accessing the NWSTG FTP server through an Internet connection will not be required to sign an agreement and will not be charged a fee.

### **7. DISSEMINATION OF WSR-88D PRODUCTS**

#### **7.1. Dissemination of WSR-88D Products During the Extended NIDS Agreements**

During the extended NIDS agreements, the NWS will limit dissemination of WSR-88D products. This is necessary to comply with the provisions of the NIDS agreements. The dissemination methods that will be used include NOAAPORT, LDAD, and dissemination directly from the central radar server. During the extension period, the NIDS providers will continue to access products directly from the WSR-88Ds and distribute them to their

subscribers.

#### **7.1.1. NOAAPORT Satellite Broadcast Dissemination of WSR-88D Products During the Extended NIDS Agreements**

To support forecast and warning operations, the NWS is currently disseminating eight WSR-88D products via NOAAPORT. To comply with the terms of the extended NIDS agreements, six of eight of these products are encrypted so that they are not available to anyone outside the NWS. The number of products transmitted will be increased before the NIDS agreement expire. The additional products will also be encrypted. A list of these products can be found in Appendix A.

When the number of products increases above eight, open standard data compression will be used to reduce the bandwidth requirements. The products now being disseminated by NOAAPORT are run length encoded (the RPG format). When compression is applied, the NWS will provide the necessary information to decompress the products and return them to the run length encoded format.

Beginning in July 2000, WSR-88D products will be openly transmitted over NOAAPORT for brief periods of time. This transmission will allow NOAAPORT users to test receiving hardware and software and product ingest and decompression. Open transmission is planned for about eight hours a day, for two days each month.

#### **7.1.2. Access to WSR-88D Products from the Central Radar Server and FTP Servers During the Extended NIDS Agreements**

During the extended NIDS agreements, users will be allowed to access WSR-88D products from the central radar server and FTP servers for test and development purposes only. The products available will include the entire unaltered NIDS products set, all Archive III products, and a few additional products. A list of these products can be found in Appendix A.

#### **7.2. Dissemination of WSR-88D Products After the Extended NIDS Agreements Expire**

After the NWS central radar server and FTP servers are operational and the extended NIDS agreements expire, the NWS will disseminate WSR-88D products in a full and open manner. The NIDS providers will be disconnected from the WSR-88Ds after a transition period of up to 90 days. They will be able to access products from other sources (i.e., the central radar server, FTP servers, and NOAAPORT), but the providers will not have the

exclusive arrangement they had under the NIDS agreements.

#### **7.2.1. NOAAPORT Satellite Broadcast Dissemination of WSR-88D Products After the Extended NIDS Agreements Expire**

The products the NWS transmits over NOAAPORT during the extended NIDS agreements will continue to be transmitted after the NIDS agreements expire. The encryption used during the NIDS extension will be discontinued. All WSR-88D products transmitted over NOAAPORT will be available to anyone with a NOAAPORT receiver. In the future, the number of products transmitted will be increased to meet NWS operational requirements. There will be no restrictions on how any products received through NOAAPORT can be used or redistributed.

#### **7.2.2. Access to WSR-88D Products from the Central Radar Server and FTP Servers After the Extended NIDS Agreements Expire**

After the extended NIDS agreements expire, all users will be allowed to access WSR-88D products directly from the central radar server and FTP servers. All products collected from all WSR-88Ds will be available. Initially, this will include the entire unaltered NIDS products set, all Archive III products, and a few additional products. A list of these products can be found in Appendix A. In the future, the number of products will likely be increased. There will be no restrictions on how any product received from the central radar server or FTP servers can be used or redistributed.

### **8. Dissemination of WSR-88D Products by Local NWS Offices**

After the NIDS agreements expire local NWS Weather Forecast Offices may disseminate WSR-88D through open local and regional Internet servers. The Local Data Acquisition and Dissemination (LDAD) function of AWIPS may be used to forward WSR-88D products to these servers. WSR-88D products may be disseminated to the emergency management community from these servers, but it is unlikely that this transmission will be operational before the NIDS agreements expire. Any transmission of products made before the NIDS agreements expire will be through a secure interface, and the users receiving the products will be informed of the redistribution restrictions.

## **9. Establishing Direct Line Connections**

Any user interested in making a direct line connection to the central radar server or the FTP server either for test or operational purposes should contact:

Michael Carelli W/OS014  
NOAA National Weather Service  
SSMC-2, Room 3343  
1325 East West Highway  
Silver Spring, Maryland 20910-3283

Phone ... 301-713-1724  
Email ... michael.carelli@noaa.gov

**APPENDIX A - WSR-88D PRODUCTS AVAILABLE TO EXTERNAL USERS (1 OF 4)**

PRODUCT NUMBER AND IDENTIFIER	PRODUCT	NIDS PRODUCT	ARCHIVE III PRODUCT	NOAAPORT PRODUCT	RADAR SERVER PRODUCT
19/R	Base Reflectivity - 124 nmi Range (Lowest Four Elevation Angles)	X	X <sup>1</sup>	X	X
20/R	Base Reflectivity - 248 nmi Range (Lowest Elevation Angle)	X	X <sup>2</sup>	X	X
25/V	Base Radial Velocity - 16 Levels, 32 nmi Range (Lowest Elevation Angle)		X		X
27/V	Base Radial Velocity - 16 Levels, 124 nmi Range (Lowest Four Elevation Angles)	X	X <sup>1</sup>	X <sup>3</sup>	X
28/SW	Spectrum Width - 32 nmi Range (Lowest Elevation Angle)		X		X
30/SW	Spectrum Width - 124 nmi Range (Lowest Elevation Angle)		X		X
31/USP	User Selectable Precipitation (24 hrs at 12Z and 6 hrs at 00Z, 06Z, 12Z, and 18Z)			X	X
34/CFC	Clutter Filter Control		X <sup>4</sup>		X <sup>4</sup>

1. Only the lowest elevation angle of this product is archived.
2. This product is not archived in clear air mode.
3. Only the lowest two elevation angles of this product will be available via NOAAPORT Satellite Broadcast.
4. The 34/CFC product is not generated every volume scan. It is generated only when the Notchwidth map or Clutter Bypass Map at the Radar Data Acquisition (RDA) is changed.

**APPENDIX A - WSR-88D PRODUCTS AVAILABLE TO EXTERNAL USERS (2 OF 4)**

PRODUCT NUMBER AND IDENTIFIER	PRODUCT	NIDS PRODUCT	ARCHIVE III PRODUCT	NOAAPORT PRODUCT	RADAR SERVER PRODUCT
36/CR	Composite Reflectivity - 8 Levels, 248 nmi Range	X <sup>5</sup>	X <sup>5</sup>		X
37/CR	Composite Reflectivity - 16 Levels, 124 nmi Range			X	X
38/CR	Composite Reflectivity - 16 Levels, 248 nmi Range	X	X <sup>6</sup>		X
41/ET	Echo Tops	X	X <sup>6,2</sup>	X	X
47/SWP	Severe Weather Probability		X <sup>2</sup>		X
48/VWP	Velocity Azimuth Display (VAD) Wind Profile	X	X <sup>7</sup>	X	X
56/SRM	Storm Relative Mean Radial Velocity Map (Lowest Three Elevation Angles)	X <sup>8</sup>	X <sup>2,1</sup>	X	X
57/VIL	Vertical Integrated Liquid	X	X <sup>2</sup>	X	X

1. Only the lowest elevation angle of this product is archived.
2. This product is not archived in clear air mode.
5. The 36/CR Composite Reflectivity product is available through NIDS and archived only in clear air mode.
6. This product is archived every third volume scan.
7. This product is archived every sixth volume scan.

**APPENDIX A - WSR-88D PRODUCTS AVAILABLE TO EXTERNAL USERS (3 OF 4)**

PRODUCT NUMBER AND IDENTIFIER	PRODUCT	NIDS PRODUCT	ARCHIVE III PRODUCT	NOAAPORT PRODUCT	RADAR SERVER PRODUCT
58/STI	Storm Tracking Information		X <sup>2</sup>		X
59/HI	Hail Index		X <sup>2</sup>		X
60/M	Mesocyclone		X <sup>2</sup>		X
61/TVS	Tornadic Vortex Signature		X <sup>2</sup>		X
62/SS	Storm Structure		X <sup>2,6</sup>	X	X
65/LRM	Layer Composite Reflectivity Maximum - Low Level	X			X
66/LRM	Layer Composite Reflectivity Maximum - Middle Level	X		X	X
67/APR	Layer Composite Reflectivity with AP Removed	X			X
74/RCM	Radar Coded Message		X	X	X
75/FTM	Free Text Message	X			X

2. This product is not archived in clear air mode.
6. This product is archived every third volume scan.

**APPENDIX A - WSR-88D PRODUCTS AVAILABLE TO EXTERNAL USERS (4 OF 4)**

PRODUCT NUMBER AND IDENTIFIER	PRODUCT	NIDS PRODUCT	ARCHIVE III PRODUCT	NOAAPORT PRODUCT	RADAR SERVER PRODUCT
78/OHP	Surface Rainfall Accumulation - One Hour Running Total	X	X <sup>2,6</sup>	X	X
79/THP	Surface Rainfall Accumulation - Three Hour Total	X			X
80/STP	Surface Rainfall Accumulation - Storm Total	X	X <sup>2,6</sup>	X	X
81/DPA	Digital Precipitation Array	X	X	X	X
82/SPD	Supplemental Precipitation Data		X		X
83/IRM	Interim Radar Message		X		X
90/LRM	Layer Composite Reflectivity Maximum - High Level	X			X

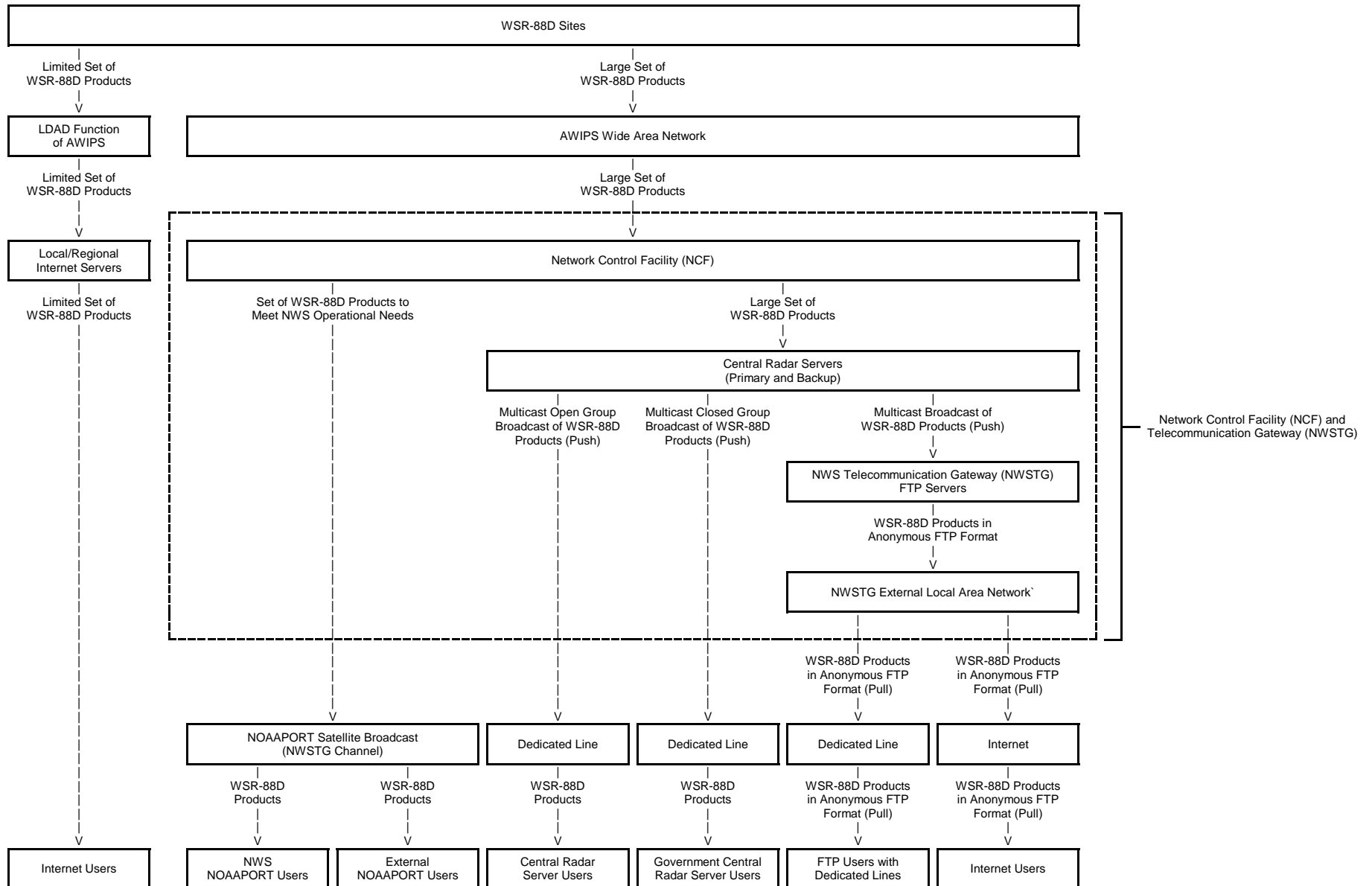
2. This product is not archived in clear air mode.
6. This product is archived every third volume scan.

**APPENDIX B - IMPLEMENTATION SCHEDULE FOR THE CENTRAL RADAR SERVER  
AND NOAAPORT DISSEMINATION OF WSR-88D PRODUCTS**

	NIDS Agreements Expire											
<u>NOAAPORT ACTIVITIES</u>												
Encrypted Products Broadcast Over NOAAPORT												
Products Broadcast Openly Over NOAAPORT												
<u>CENTRAL RADAR SERVER ACTIVITIES</u>												
Server Implementation and Testing												
Functional Testing with Government Users												
Expanded Testing with Government and External Users												
Operational Demonstration												
Certification of Operational Readiness												
Transition Period*												
Central Radar Server Operational												
Month	O	N	D	J	F	N	A	M	J	J	A	S
Year	1999			2000						2001		

\* After the NIDS agreements expire and the central radar server is operational, the transition period is a 90-day period in which the NIDS Providers may continue to access the WSR-88D products at the radar sites.

## APPENDIX C - DISSEMINATION OF WSR-88D PRODUCTS AFTER THE NIDS AGREEMENTS EXPIRE



**APPENDIX D - SYSTEMS FOR THE CENTRAL DISSEMINATION OF WSR-88D PRODUCTS**

<b>DISSEMINATION SYSTEM</b>	<b>USERS CONNECTED</b>	<b>CONNECTIVITY</b>	<b>PRODUCTS AVAILABLE</b>	<b>USER AGREEMENT REQUIREMENT</b>	<b>FEES</b>
MULTICAST OPEN GROUP	Any user may connect	Dedicated Line	All centrally collected WSR-88D products	Users required to sign an agreement with the NWS	Cost recovery for the NWS' cost of dissemination <sup>2</sup>
MULTICAST CLOSED GROUP	Government users <sup>1</sup>	Dedicated Line	All centrally collected WSR-88D products	Users required to sign an agreement with the NWS	Cost recovery for the NWS' cost of dissemination <sup>2</sup>
ANONYMOUS FTP WITH DEDICATED LINE ACCESS	Any user may connect	Dedicated Line	All centrally collected WSR-88D products	Users required to sign an agreement with the NWS	Cost recovery for the NWS' cost of dissemination <sup>2</sup>
ANONYMOUS FTP WITH INTERNET ACCESS	Any user may connect	Internet	All centrally collected WSR-88D products	No agreement with the NWS required	No fees
NOAAPORT SATELLITE BROADCAST	Any user may connect	NOAAPORT receiver	Set of WSR-88D products intended to meet NWS needs	No agreement with the NWS required	No fees

1. In the future the multicast closed group broadcast may be available to all users.
2. The NWS may waive the fees for government users and for organizations with cooperative agreements with the NWS.

## **APPENDIX E - ACRONYMS**

APO ..... AWIPS Program Office  
AWIPS ..... Advanced Weather Interactive Processing System  
  
FTP ..... File Transfer Protocol  
  
LDAD ..... Local Data Acquisition and Dissemination  
  
NCF ..... Network Control Facility  
NCDC ..... National Climatic Data Center  
NCEP ..... National Centers for Environmental Prediction  
NEXRAD ..... Next Generation Weather Radar  
NIDS ..... NEXRAD Information Dissemination Service  
NOAA ..... National Oceanic and Atmospheric Administration  
NWS ..... National Weather Service  
NWSTG ..... NWS Telecommunication Gateway  
  
OSO ..... Office of Systems Operations  
  
RDA ..... Radar Data Acquisition  
  
TDL ..... Techniques Development Laboratory  
  
WAN ..... Wide Area Network  
WSR-88D ..... Doppler Weather Surveillance Radar